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The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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Original Correspondence.

COLLIERIES IN NORTH DURHAM, THEIR WORKINGS AND MACHINERY—No. V.

The Felling Colliery, during the last eight years, has been carried on by Mr. George Elliot, M.P., as proprietor, and Mr. S. B. Coxon, as viewer. The area of royalty originally attached to it was considerable, one-half of which is now colliery freehold, but an addition was recently made to it, which, with the enterprise of the present owner in developing the lower seams of coal, will give new life to the colliery, and extend its duration to many generations. The High Main seam has been got in the original lease, on the old method of leaving thin pillars, for which about eight pits had been put down. These workings are now abandoned, and to a considerable extent flooded with water, which, it is expected, will ultimately be drained by the Wallsend pumping operations. The only other seam which has been worked in former years is the Hutton seam, now entered by two pits: the coal pit, 7½ ft. in diameter, 101 fms. in depth, which is also the means of ingress for air; and the upcast pit, 8½ ft. in diameter, 128 fms. in depth, 500 yards west of the former, the upcast column being heated by two furnaces at the bottom of it. The original part of the property is worked out to a considerable extent; there are pillars still remaining, which, though "crept," will be available for working at increased cost. The present coal pit has been in operation 60 years for the Hutton seam. The mine has been the scene of several serious explosions in its early period, the principal of which, in the year 1812, was attended with a loss of 96 lives; another, in 1825, with a loss of about 28 lives; and another, in 1840, with a loss of about 25 lives. With respect to the two first accidents, they have been accounted for by those competent to judge on the matter, from accumulations of gas occurring, not so much in goaves, which can only partially be approached by ventilation, but in the back workings behind the working faces; these not being traversed or "coursed" by air-currents, formed a magazine of explosive gas in proximity to the working face. The greatest care may have been taken to shut off these accumulations and abandoned places from the working parts; this care still did not prevent the spreading, beyond its prescribed bounds, the miners' great enemy—fire-damp—the probable result being an explosion, resembling, in many cases, the eruption of a volcano at the mouth of the pit. The explosion in 1840 was said to have originated from the boiler-flue underground, in a similar manner to the more recent case at Hetton. At all the explosions referred to at Felling Colliery it was found necessary, before the mine could be entered, to close the downcast and upcast pits, in order to exclude air from the workings, owing to the ignition of the coal in each instance. In 1840, after the pits had been stopped by dams for six weeks, the fire was found not extinguished, and they were again closed. The great evil of the old practice was in allowing accumulations of gas to take place in abandoned parts of the mine. Modern practice deals with these parts of the mine very differently, giving a copious circulation of air in every place, whether worked or abandoned, so as to carry off the gases as they are emitted from the coal. It endeavours also to draw the enemy from its stronghold—the goaf, which is best done by making points of escape for it at the highest level of each separate goaf. The improvement in the circulation of air is shown by that at Felling, which in 1840 would be about 7000 cubic feet, in 1862 was 14,000, and at the present time is 70,000 cubic feet per minute.

The winding-engine has been in action here 60 years; it is a beam-condensing engine, with 28-in. cylinder, 6-ft. stroke, direct-acting, 12-ft. cylindrical drum, fly-wheel and foot-break on under half. Two plain boilers supply steam at 12 lbs. pressure; these are covered by a shed. Counter balance works in a staple behind the house. About 380 tons of coal is raised daily in two-decked cages, two 7-cwt. tubs in each cage. The same engine raises water at nights in two iron tanks, which replace the cages; each tank holds 300 gallons of water, is self-filling and self-delivering at the bottom and top of the pit; one tank may be raised and discharged per minute. A beam-engine for hauling underground is placed at the top of the pit; it has one 40-in. cylinder, 6-ft. stroke, two 8-ft. cog-wheels, one drum 8 ft. in diameter, 2-ft. wide, with double break—fly-wheel, 24 ft.; break on under half; one eccentric and slide-valve. An addition to the power has been made by placing a 22-in. horizontal cylinder, 4-ft. stroke, in connection with the main shaft. Four plain boilers, 35 by 6 ft., uncovered, supply steam at 40 lbs. pressure. The boiler feeder is an 8-in. horizontal cylinder, with 4-in. ram. The engine plane is 2000 yards in length, going in a south-east and afterwards in an east direction to the dip. From the pit it commences in the Hutton seam; then at a dip of 4 in. per yard is driven under the Hutton seam, and through a 25-fathom downthrow fault until the Hutton seam is again reached; the gradient varies from 2 to 6 in. per yard. The set of 42 empty tubs run inwards by their gravity in 10 minutes; the laden set is pulled out in the same period. The rope is 3¾-in. in circumference, enclosed by boxes in the pit, it passes over an 8-ft. pulley at top, and a 10-ft. pulley at the bottom of the pit.

The Hutton seam is whole over a large area in this district; the Low Main, Bensham, and Bustybank seams are almost intact over the whole property, besides other seams untouched—the Harvey and Brockwell—which will ultimately come under operation. The Hutton and Low Main coal is brought from the extremity of the engine plane; the latter is dropped down by a staple to the Hutton seam. The Bensham, or Maudlin coal, is taken from a station or stopping place about three-fourths of the total length inbye; from this point in the Hutton seam a stone drift is driven to the Bensham seam, 250 yards in length, rising 6 inches per yard, which forms a self-acting incline.

Section of the Bensham seam in this district of the mine:—

1.—Metal roof.			
2.—Brass band	0	ft. 2	in.
3.—Top coal	2	10	
4.—Fire-clay band, poor	1	6	
5.—Coal	1	6	
6.—Shale band	0	0½	
7.—Coal	0	7	=4 ft. 11 in. workable coal.
8.—Fire-clay, inferior.			
Total	6	7½	

The band No. 4 is 36 ft. in thickness at the pit. The Low Main seam is 3 ft. 10 in. of clean coal, suitable for steam purposes; it lies 16 fms. above the Hutton seam. The Hutton seam has 5 ft. of good soft coal, stone band 1 in., inferior bottom coal 1 ft. 4 in., and shaley fire-clay beneath. Water is raised on the engine bank, 2000 yards in length and 480 feet vertically, by the hauling-engine five hours each night, in iron boiler-shaped tanks; some hold 300 gallons, others 500 gallons; each has a hole for filling at the top, and a discharging valve at the bottom.

At the distance of 200 yards south of the coal pit another pit is sunk from the Hutton seam, 8½ ft. in diameter, divided by brattice, to the depth of 80 fms., intersecting the Harvey seam at 28 fms.; a seam of 5 ft., with two small shale bands in it, at 34 fms.; two other seams below these, each 2 ft. in thickness of good coal, and the Busty-bank seam, at 62 fms. The Brockwell seam is conjectured to be not much below the bottom of this pit. Section of the Bustybank seam:

1.—Top coal	1 ft.	5 in.
2.—Band of shale	7	0
3.—Good coal	3	0
4.—Fire-clay, good—used in brickworks	1	6=4 ft. 6 in.
5.—Fire-clay, inferior.		

The bed of coal, No. 3, and the fire-clay, No. 4, only are got. About 50 tons of coal is raised per day from this seam. The exploring workings are going in the direction of Tyne Main Colliery, with a view to a communication with that pit. The coal is raised from the Bustybank seam by an engine at the top of the pit, with two 10-in. horizontal cylinders, 22-in. stroke, pinion and spur-wheels, in ratio of 2½ to 6. Two drums, 4 ft. 4 in. diameter, 17 in. wide, on one shaft, 8-ft. fly-wheel. Four eccentrics and slot links. Single-tub cages are used. The engine also pumps water at night by another spur-wheel and shaft, the wheels being proportioned as 2½ to 6. Both spur-wheels are put in or out of gear by slide carriages. The pump is 300 yards down east to the dip, at the rate of 3 in. per yard, in the Hutton seam. One 10-in. bucket-pump of 3-ft. stroke, is worked by means of iron and wood rods running on rollers; the main pipes are 5-in. diameter; total elevation, 75 feet. One Cornish boiler, made of forged plates, is fixed near the engine, 19 by 5 feet, with 2 feet tube, supplies it with steam at 35 lbs. pressure; it is fed by 2-inch pipes, brought from the surface. This engine and boiler have been in use about 50 years, and have been fixed in other places in this mine. The smoke from the boiler fire is conveyed away by a brick flue, built near one side of the road or air-way, the flue extends to the upcast pit a length of 650 yards, it is arched, is 4 ft. in height, 2 ft. wide. In this flue the explosion of 1840 is said to have originated. A 10-in. horizontal engine, with one boiler, is kept in reserve at the furnace pit, for raising men there if required, with one rope.

In the Felling coal pit, 19 fms. of wood curb tubbing and 14 fms. of metal tubbing is inserted, at and about the High Main seam., Forty coke ovens are erected, in one double row, 11 feet, dome-shaped with a double flue between each row, each flue is 4 ft. by 1 ft. 9 in. in width. One chimney is erected, 6 ft. square inside, 80 ft. in height. The ovens are charged at the door, and the coke is drawn by hand.

The wagon beam-engine, near Felling pit, has a 20½-in. cylinder, 5½-ft. stroke, one 6-ft. pinion, two 6-ft. spur-wheels, two 5-ft. drums on separate shafts, 12 in. and 18 in. wide, 16-ft. fly-wheel and break, one eccentric and slide-valve. Steam supplied at 40 lbs. pressure, from one Cornish boiler, 35 by 6 ft., 2 ft. 9 in. tube, with a shed over it. The engine hauls empty wagons from the staiths at Felling Shore, 1200 yards distant, also laden wagons from the pit up to the siding on the North Eastern Railway, by means of a return-wheel; the wagons run down by their gravity the contrary direction, in each instance.

Tyne Main Colliery.—This has been carried on by Mr. George Elliot for the last six years, and adjoins the Felling property. Two pits, 12 yards apart, were sunk to the Hutton seam in 1840—one as a coal pit and downcast, the other as a special upcast, with furnace, 110 fms. in depth. The winding-engine has one 32-in. cylinder, 6-ft. stroke, with levers, 14½ ft. flat-rope drums; it raises both Hutton and Bensham coals from their respective levels. A small engine is now used for raising water, with 22-in. vertical cylinder, 4-ft. stroke; it works a lift of 50 fms. in the pit, 8-in. bucket, from a feeder at that level. At the High Main seam the shaft is defended by cast-iron tubbing, by which the water in that seam is excluded from it. The Tyne Main large pumping-engine has been standing during the last 16 years; it has a 72-in. cylinder, 8-ft. stroke, and equal beam; it raised water from the High Main feeders, with a double lift of 50 fms., two 18 in. bucket columns, both delivering at the surface; the water raised per stroke would be 176 gallons; when the engine discontinued pumping the water raised amounted to 1800 gallons per minute. The stopping of this engine was an unfortunate circumstance for many of the Tyne collieries; the water, which had been raised here in one short lift, after the discontinuance found its way to the deep collieries, more particularly the Percy Main, and eventually caused the engines there to be stopped, owing to the overpowering influx of water.

The fire-brick works in connection with this colliery are situated at Felling Shore; the fire-clay from the Bustybank seam is used. The clay-mill is of the usual type. The mill-engine has 12-in vertical cylinder, 3-ft. stroke. About 5000 bricks are moulded per day; these are burnt in three kilns, each of which contains from 10,000 to 11,000 ordinary bricks. There is one chimney to each kiln. The new staiths at Felling Shore for the shipment of Felling, Tyne Main, and Usworth coal have just been erected on the most approved principle; they are designed for loading screw-steamers drawing 10 ft. of water, at any time, irrespective of tides; there will be 14 ft. depth at low water under the spouts. There are two shipping places, arranged so that a vessel may be loaded at both hatchways at the same time. At each shipping place three spouts are placed, one above another, either of which can be used as the height of water varies. The three spouts hold together 70 tons of coal. Each set of spouts is provided with two turn-tables, two crabs for raising the moveable end for the spouts, and apparatus for opening and closing the door in each.

Blast-Furnaces.—The invention of Mr. J. Bernard, Salisbury-street, Strand, consists of an improved blast-furnace or furnaces, which is or are more especially adapted for the carrying out of the improved process hereafter described, and which consists as follows:—Close to or in connection with the present ordinary Castillian or other furnace, the inventor places a covered vessel, cistern, well, or supplementary furnace, which he hereinafter calls the "volatiliser," or he extends or elongates the existing furnace so as to form a volatilising chamber. Into the said "volatiliser" he permits or causes the contents of the ordinary furnace to flow, except such metal, mat, or slag as is drawn by tapping from its well after being converted into a liquid or fluid condition, containing less or more metal, the "volatiliser" being placed at such an elevation in relation to the ordinary furnace as will admit of the ready flow into it of the liquid product or slag. When the "volatiliser" contains a sufficient charge of air, steam, or gas, or mixtures of the same is or are forced into the said volatiliser, or this part of the furnace, and through its contents, until the temperature and fluidity are increased to any desired state, and a blast of air, steam, or gas may be directed upon the liquid mass so as to impart a circular or other motion to it in the said volatiliser, after which the blast is suspended, and further time is given for the metal to fall to the bottom, the contents being drawn off by tapping the volatiliser or otherwise.

Steam-Boilers.—By the invention of Messrs. W. Arnold and W. Carnelley, Barnsley, fire-places are provided, surrounded by the usual water space, beneath which a combustion chamber is adapted, closed at the front. Two cross flues open at their inward ends into the two fire-places, and at their outward ends communicate with spaces formed by the setting of the boiler, and upon which setting it rests, but there are openings, commonly called pigeon-holes, formed, whereby communications are established between the spaces and the combustion chamber. At the back end of the combustion chamber is a stop extending across the whole width of the setting, and immediately in front of it is a flue passing upwards through the boiler, and leading into a chamber formed therein.

Furnaces.—The invention of Mr. W. Waller, Newcastle-upon-Tyne, consists in substituting for or combining with the ordinary grate bars a train of spindles or shafts, either mounted with cams or eccentrics, or made of such shape that the external surfaces of each alternately approach to and recede from the centre of the next spindle, at the same time that the spaces between the surfaces of adjacent spindles remain nearly or quite the same. These spindles are to be actuated simultaneously, so as to break up and pass forward the fuel being upon the cams or surfaces. A train of two or more of such spindles may be used to supply fuel to a furnace of any known form, and whether it has moving parts or the common fixed furnace grate or fire-bars. A similar train may be used for carrying from the back of a furnace any clinkers, lumps, stones, or other residues; or for forming a second grate for the further combustion of the fuel or the coked, or partially consumed fuel, passing from a first or second set of revolving or other bars.

THE SILKSTONE COAL FIELD.

One of the most important coal fields in the kingdom is that in which the well-known Silkstone seam is to be found. Commencing at its southern extremity near to Alfreton, in Derbyshire, it proceeds through South Yorkshire, and terminates in the Wakefield district. It is met with at various depths, and forms the datum line for determining the position of most other beds, its fossil flora being the richest of all other seams in the same field. Its actual extent at present is scarcely defined—for, unlike the great coal fields of the North of England and South Wales, it has not been explored. The thickness of the seam varies considerably, as does also its quality, that raised in some parts of South Yorkshire being probably the best. As a house coal it is considered equal to the Northumberland or Durham, and is reputed to be the best for gas purposes in Yorkshire. The following is an analysis of that worked by the firm of Newton, Chambers, and Co., at the Thorncliffe Collieries, and which may be taken as a fair sample of what is raised in the same district:—

Description.	Gas per ton. Cubic feet.	Illuminating power. Candles.	Coke per ton of coals used. Cwts.	Sulphur in coal. Per cent.
Best Silkstone	10,900	17·00	12·8	1·7
Norfolk Silkstone	11,000	15·94	12·5	1·64
Silkstone Brights	11,500	14·5	12·6	1·85
Silkstone nuts	10,800	15·85	12·66	0·69

In the extensive workings of the Barnsley Nine-feet coal, the Silkstone seam underlies that bed at an average depth of about 385 yards, but in no instance has it as yet been sunk through the former. There is, however, just now every appearance that sinkings from one bed to the other will take place before long, as there are now many thousands of acres of the seam in the market, and which will be let at a fair and moderate royalty. As the Barnsley bed is being worked for miles in a straight line, and with many miles yet untouched, it will be for future and remote generations to raise a tithe of the Silkstone seam that lies below it, and many hundreds of years will no doubt elapse before the millions of tons of coal of which it is composed will be spoken of as likely to be exhausted.

In South Yorkshire the seam in some places is 6 ft. thick, and has been sunk to in most instances towards the margin, where it leaves the Barnsley Thick bed. It takes its name from a village four miles from Barnsley, the greater part of which at present belongs to Mr. R. C. Clarke, the owner of the Old Silkstone Collieries, and whose grandfather was the first to work the seam to any extent in the district. That would be about the year 1770, when the price of eight "pulls" or "corves," rather more than a ton, was 1s. 10d. The two or three pits then being worked were simply inclines, going gradually down from the surface. The coal then raised was simply for local consumption; but in 1773, with a view to extending operations, an Act was applied for to form a canal, as the owners of land between Barnsley and Silkstone had been boring for coal, and amongst them the late Mr. Jonas Clarke, Attorney-at-Law, Barnsley. On Sept. 9, 1773, a meeting of landowners was held at Barnsley, when it was agreed that an Act of Parliament for the making of a canal from the River Dearne to Barnsley Bridge, a distance of between three and four miles, should be applied for. The Act was granted, and the canal was in due time finished.

After the formation of the canal shafts were sunk to a greater depth than they had been before. The first pit of any depth was commenced at Barmby Furnace in 1803, and the first fatal accident from an explosion of gas in that part of the country took place on Aug. 19, 1805, causing the death of seven men, including John and Mark Teasdale, who had come from the North of England expressly to sink the shafts, the last named being appointed bottom-steward when the coal was reached. The explosion was caused by the gas coming in contact with a lighted candle, the Davy lamp at that time not having reached Yorkshire. So terrible a catastrophe as the loss of seven men by to many a new source of destruction caused a wide-spread and powerful sensation, and the deceased were followed to their final resting place by large and deeply sympathising numbers. To perpetuate such a fearful loss of life a memorial stone was placed in the churchyard of Cawthorne, where the men were buried. The partiality of the miners in all parts of the country for poetical effusions in reference to their deceased relatives, as seen in the present day by the funeral cards and memorial tablets to be found in almost every collier's house, was the same at the time stated, for on the tombstone alluded to was an effusion by a local genius, commencing as follows:—

"Stop, passenger, dread Fate's decree peruse,
One stone stands here for seven interred, thou views."

Since then, alas! how many hundreds in the same locality have been swept away at one feel swoop by the same dread agent; and even whilst writing this notice it is telegraphed that a vast number of miners working exactly the same seam have been killed by an explosion at Eckington. *Requiescant in pace.* In July, 1838, a serious accident from another cause took place at one of Mr. Clarke's pits at Silkstone. Owing to a terrific storm which occurred in the southern part of Yorkshire, the valley near to the village was inun-

dated, and the water rushed into the Moorside Pit, and 26 persons, including 11 females, many of them not more than 11 or 12 years of age, were drowned. All their names are inscribed on a handsome monument, the most conspicuous object at present in the churchyard of Silkstone.

The first coal sent by water took place in July, 1805, when a boat was loaded in Barnsley Basin, and dispatched to Goole, and there transhipped into the sloop Ripon, Steele master, bound for London. The coals were consigned to T. M. Wilson, but the expenses at that time were too high for a trade to be established. The expenses and dues paid for coal going to London 70 years ago are a curiosity worth noticing. The following was the bill relating to the 40 tons of coal sent to London from Silkstone:—

To freight from Goole	£23	4	0
King's duty, bond, and sack	17	9	0
Meter's sample	1	1	0
Bill entry and holiday fees	0	3	6
Cocket fee, water bailiff, and Trinity dues	1	1	0
Metage and orphans' duty	1	14	0
Discount, scorage, and expenses	1	15	0
Commission	1	1	0
Lord Mayor's due	0	2	6
Nore Light and market dues	0	3	6
10 labourers, at 3s. 1d. per score	0	4	0
Total	£50	18	6
Coal sold for	£64	12	0
Deduct expenses	50	18	6
For coal and freight to Goole	£13	13	6

It will be seen that the dues, &c., were about 12s. per ton. Some of the items are such as are unknown now. At the present time the Silkstone seam is being worked at Thorncliffe, Pilley, Worsborough, Strafford Main, and a few other places, the greatest depth at any of them being about 240 yards. For its development we must look to the time, now fast approaching, when it will be sunk to from the Barnsley bed. Such would have been the case but for the lamented death of Mr. Parkin Jeffcock, in the Oaks Colliery, in 1866, as that gentleman was in treaty for nearly 3000 acres of that coal on the Edmund's and an adjoining estate at Worsborough. Between the Barnsley and the Silkstone seams there are several others which could be profitably worked. The Swallow Wood coal is about 3½ ft. thick, whilst about 50 yards lower down is the Lidget bed, of good quality. Still lower down is the Joan coal, beneath which is the Tankersley Ironstone Mines, which are also very valuable. The next stratum is the Flockton Thick bed of coal, in high repute for household purposes. About 100 yards from the Silkstone seam is the Parkgate coal, and after that the Thorncliffe—both of good quality.

It will be seen from the vast extent of the Silkstone coal field as yet untouched throughout the southern part of the West Riding of Yorkshire, in which it underlies the Barnsley bed, that there need be no fear of the coal being exhausted there for many hundreds of years to come. There is also the coal under the magnesian limestone, which has not as yet been sunk to, and, as has been said by one of our principal mining engineers, "it will be for the enterprise of a hundred years to come to test the extent of the vast field of wealth reposing under that mighty formation." It has been said that the great depth at which the Silkstone coal would have to be worked under the Barnsley bed would be an almost insuperable bar to opening it out. Recent sinkings, however, have shown that mines can be worked at a much greater depth than has hitherto been supposed possible. The Rose Bridge Colliery, now the deepest in England, being 813 yards from the surface, is an example that such is the case. In the South Yorkshire district the depth at which the Barnsley seam is got, with two or three exceptions, is not more than 300 yards—so that, giving 385 yards from it to the Silkstone, it would then be far short of the Rose Bridge depth. Thrybergh Hall is 288 yards deep; Darfield Main, 337 yards; Wombwell Main, 224 yards; the Oaks, 293 yards; Swaithe Main, 230 yards; Craik and Co.'s, 161 yards; Mount Osborne, 192 yards; and North Gawber, 107 yards. At all of those collieries the Silkstone seam would be at a depth which could be safely worked, and there is no doubt but the owners, who are now desirous of having the minerals on their property developed, would agree to accept such a royalty as would make the venture profitable to those capitalists who would open out such a valuable bed of coal as the Silkstone is known to be, and which is so much appreciated in the metropolis.

SUPERSEDING GUNPOWDER IN BLASTING.

SIR,—In the Supplement to the Journal of Jan. 7 I notice a letter on "Superseding Gunpowder in Blasting," signed "R. W. B." In consequence of being constantly travelling about I have only just seen the letter, and for the information of "R. W. B." beg to give the following particulars of Experiments with Mr. J. Grafton Jones's Patent Hydraulic Wedge Machine:—

Trimdon Grange Colliery—Main Coal.—Kirved in band 3 ft. 3 in. from bottom, 2 yards in, 6 yards long, fast at one end; boardwise way of the coal. Put 2½-in. instrument in 2½ yards from fast end; broke all up as far as kirved; in all 29 tubs of 8 cwts. each. Drilled a hole 3 ft. in, in 9 minutes.

Thornley Colliery—Five-Quarter Seam.—Kirved in bottom 3 ft. in thickness of seam 4 ft. 10 in length of jud 10 yards, boardwise way of the coal; loose at one end. Put 2½-in. instrument in close to top in middle of jud; broke all down excepting about 3½ yards from fast end; put 2½-in. instrument in fast end, and brought the remainder down. The coal in fine lumps, and after passing over the screens yielded 71 per cent. of large coal, *with kirvings.*

Thornley Colliery—Five-Quarter Seam.—Kirved in bottom 3 ft. in thickness of seam, 4 ft. 10 in.; length of jud 4 yards, boardwise way; of the coal, nicked at one end. Put 3-in. instrument in close to fast end at top; broke all down square in the corner, in one solid coal, which broke into large lumps by the fall.

Thornley Colliery—Low Main Seam.—Kirved in bottom 1 ft. 8 in. in; height of seam, 2 ft. 10 in.; length of jud, 7 yards, fast at both ends, boardwise way of the coal. Put two machines in, one at each end, about 1½ yard from end; brought all down on to bottom, where it rested till bottom was cleared away. Height of kirving in front, 9 in. The 2-in. instruments strong enough.

Thornley Colliery—Main Coal.—Kirved in band 3 ft. 3 in. from bottom, 3 ft. 8 in. in; length of jud, 8 yards, boardways way of the coal; one end fast. Put 3-in. instrument in 3 yards from loose end, and afterwards the same machine in fast end; broke all up into lage lumps right for filling. The 2½-in. instrument strong enough.

Murton Colliery—Low Main Seam.—Kirved on top 3 ft. 6 in. deep, leaving 3 ft. 3 in. of coal to break up; length of jud, 5½ yards, fast at both ends. Put in 3-in. instrument, 2 yards from one end, and afterwards 1 yard from the other end; broke all up right for filling, in all 12 tubs of 9 cwts. each.

Murton Colliery—Hutton Seam.—Drilled hole in blue metal roof above a band of white tough post 3 in. thick, and about 12 in. of blue metal, and broke about 2½ tons of stone down with three holes, each hole taking about 20 minutes to drill and break down. Holes drilled 2 ft. 4 in. deep in 7 minutes.

In all the experiments in coal the instruments make much larger coals than when got by powder, also the coal is much sounder, and will carry to market better. The saving of slack is considerable, according to the nature of the coal. The time occupied in drilling the hole and getting the coal down varies from a quarter to half-an-hour. The time occupied in drilling the holes 3 ft. deep varies from 9 to 15 minutes, including fixing the machine. Diameter of holes, 2¼, 2¾, 3¼, and 3¾ inches.

	Power with one man.	Diameter.	Weight complete.
No. 1 machine	200 tons	2 in.	40 lbs.
No. 2 machine	300 ,,	2½ ,,	59 ,,
No. 3 machine	400 ,,	3 ,,	88 ,,
No. 4 machine	500 ,,	3½ ,,	112 ,,

The 2¼ and 3-inch machines have been constantly at work since October 4, 1870, and have given no trouble whatever, excepting the wedges, when under excessive pressure, becoming compressed at the point. This inconvenience has been entirely overcome by a modified form of point and proper tempering.

The most advantageous method of using these machines appears to be attained by working the coal on the long wall system where practicable, as by this means more coal is got at one fall; and by placing two or more small instruments at intervals in a long face of coal the whole may be brought down at once by working the instruments simultaneously, and thus distributing the pressure along the whole of the face.

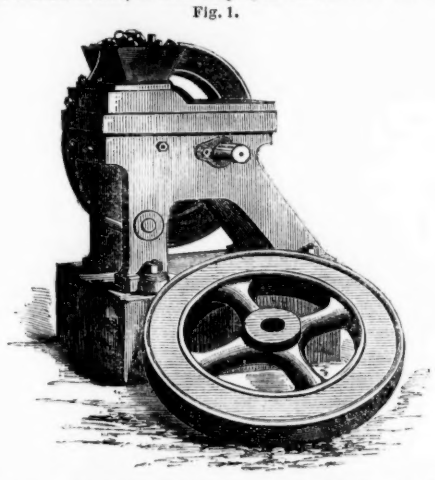
By inserting the above in your next Journal you will oblige—
Ingram Terrace, Sleaford, Jan. 17. G. W. ELLIOTT.

DRESSING MACHINERY—STONE BREAKERS—No. III.

SIR,—These machines may often be advantageously substituted for hand labour, particularly when it is necessary to select merely the unproductive stone, and to pass the remainder direct to the crusher or stamping mill. When, however, a portion of the stuff has to undergo a cobbing process, the quantity of "smalls," as well as the dissimination of the ore in the "dradge," must be considered, since it is obvious that with a hand sledge a workman will be able to get rid of a maximum amount of sterile rock, and thereby materially enrich the stone for the more tedious and costly process of cobbing. The judicious introduction of these machines into dressing works will, therefore, be governed by several circumstances, among which may be included considerations of cost of labour, character, quantity, and value of the orey stone. In this country Blake's stone-breaker, driven by a belt, is generally employed, and is sufficiently well known to need no general description.

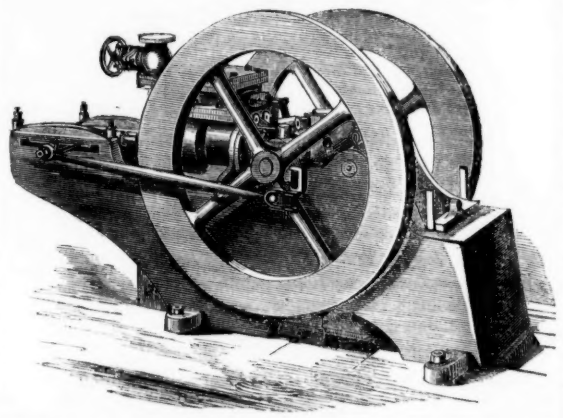
In Prussia, where no patent right for stone-breaking machines exist, a valuable modification has been made in the jaw pieces, these being formed by some makers so as to admit of the crushing parts being turned bottom upwards when the first halves of the latter are worn out. A small machine for reducing "raggings," or orey stuff, from ½ to 1 inch in size, is also employed on some of the German

Fig. 1.



dressing-floors, and which machine is represented in Fig. 1. The jaw pieces of this apparatus are 7½ in. deep by 4 in. wide; the driving power required is one horse, and the quantity of stuff reduced per hour is from 1 ton to 1½ ton. As in the larger sized machines, it has two fly-wheels, one of which, in the figure, is shown lying on the ground.

Fig. 2.

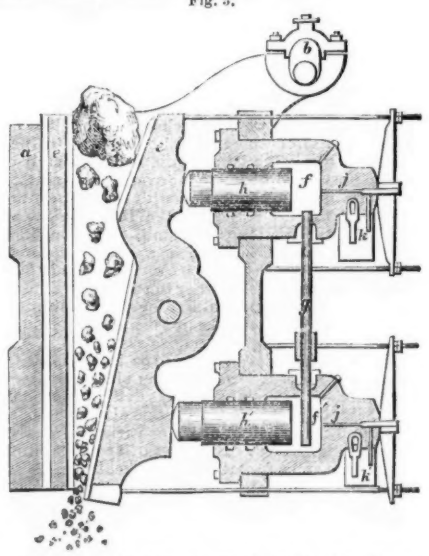


A steam stone-breaker, constructed by Sievers and Co., is shown in Fig. 2. The frame carrying the jaw pieces is extended from the body, for the purpose of taking a steam cylinder, from 10 to 12 in. diameter, with an equal length of stroke. The fly-wheels are connected to the cross-head of the piston-rod by means of ordinary side rods. The steam-valve is attached to a rocking lever moved by an eccentric, set on the fly-wheel shaft.

A machine of this class, making from 200 to 250 revolutions per minute, with jaw pieces 24 in. deep by 15 in. wide, moving from ¼ in. to ½ in. per stroke, will take in stones presenting a section of from 6 to 8 in., and reduce them to a guage of from 1 to ¼ in.

A steam stone-breaker may be used with economy at the mouth of a mine, where it is desirable to transport a minimum quantity of veinstone to the dressing-floors, and also in cases where the dressing machinery is driven by a water-wheel of limited power. By such an arrangement irregularity of motion may be lessened in the jiggers, buddles, and shaking tables.

Fig. 3.



An hydraulic stone-breaker, patented by Mr. Chambers, and extensively used in the colony of Victoria, Australia, is shown in Fig. 3. *a*, cast-iron frame, carrying a shaft, *b*; *c c*¹, jaw pieces of chilled iron; *f f*¹, two water cylinders, with small plunger cases, into which work a plunger, *g*. This plunger, *g*, has a stroke of 6 or 7 inches, and is driven by a rod in connection with the driving shaft, *b*. The movement given to the small plunger produces a subordinate movement or stroke of ½ in. in the large plungers, *h h*¹, the ends of which press on the articulated mouth piece, *c*. Small relief rams, *j j*¹, subject to a heavy spring pressure, govern the crushing force of the jaw piece, whilst two induction valves, *k k*¹, serve to supply such a portion of water to the large cylinders as may be forced out, or otherwise escape. Each plunger makes about 300 strokes per minute, whilst the jaw pieces of some of the machines are sufficiently large to reduce stones from 9 to 12 inches thick to pieces which will pass through a 1-inch gauge.

The jaw-pieces of stone-breakers should be formed of *double chilled iron.* Soft and badly hardened iron is highly *objectionable*, since, with the early inefficiency of the jaw-piece, together with cost and delay attendant on replacing the same, the cost of reducing stone per ton is proportionably increased.

A pair of good jaws, 12 in. by 9 in., will cost 3*l.*, to which must be added 1*l.* 10s. for taking out old jaw-pieces and putting in new ones, or, together, 4*l.* 10s. A bad pair of jaws will not break 500 tons of stone properly, whilst a well hardened pair will, at least, dispose of from 2000 to 3000 tons of siliceous vein stone.

In some dressing establishments sizing trommels are placed under the stone-breaker, in others flat sizing sieves are reciprocated by a rod attached to the movable jaw.

The stuff is also discharged on rotating or fixed tables, or on travelling bands, the latter being constructed somewhat on the principle of the patent coiling window shutter.

The following table shows the approximate quantity of stone broken by jaw-pieces of various dimensions, also the power required, the eccentric shaft making 200 revolutions per minute:—

Dimension of mouth piece.	Quantity of stuff reduced per hour.	Horse power required.
24 in. × 15 in.	Tons 12½	12 to 15
18 in. × 12 in.	8	7 to 8
12 in. × 9 in.	5	4 to 5
9 in. × 6 in.	3	2
7½ in. × 4 in.	1½	1

JOHN DARLINGTON.

MINING IN NEVADA, AND MINING IN GENERAL.

SIR,—Under the heading "Mining in Nevada," I read in the Supplement to the Journal of Jan. 7 a letter from Mr. J. E. Bowe, an American gentleman, who is connected to some extent with silver and gold mining in the Western States of the Union. The purport of his letter is to show, endeavouring as he does to prove with practical data, the great injury, to his interests especially, as also to whole districts in general, resulting from, as he says, "the sad mistakes made by the so-called practical miners who are now and then sent out to North America from this country, to report on or manage silver and gold mines."

I quite agree with Mr. Bowe, for his case is not a solitary one; as he must be aware that several English companies out there have, also, very recently been seriously injured by some so-called practical miners of this country, to say nothing of the bad results arising from the same cause in the case of the Chontales Mining Company, of Nicaragua, *before* Mr. Belt was sent out there. There are many other cases I could cite in Mexico. A practical copper miner there gave a report on some silver mines, in which he said that the ground ready for stoping would produce 60,000*l.* worth of silver ore. I was requested to give a report, and I saw that barely 7000*l.* worth could be produced; but the practical copper miner carried the day for a time. Two years afterwards all the ground was stoped away, and about 6000*l.* worth was produced, and the company was wound-up voluntarily. However, I am digressing from the object of my letter. "These sad mistakes," as Mr. Bowe says—for he certainly draws these matters out most mildly, considering how he has been injured by the so-called practical men—are not confined to America alone; they have often come under my notice in Mexico, Chili, Peru, and other countries.

The question Mr. Bowe should ask himself is—What are the causes? I believe I can answer. There is a notion amongst the English public in general that a practical miner is a species of Pope, something infallible, who can work miracles underground, as his Holiness does at grass. Therefore very often too much is exacted from him by the boards of foreign companies. He is expected to know a great deal, but he is never questioned on the subject; it is taken for granted generally. He is supposed to know many things of which he has not the least notion—metallurgy, minerallurgy, geology, assaying, and many other things, which can only be acquired at a mining college. Therefore, in most cases, he is rated by such mining boards far above his practical knowledge. Hence, I ask Mr. Bowe who is to blame? Certainly not the practical miner, for he is sent abroad to manage silver, gold, or any other class of mines which do not exist in England, or, at any rate, only of late, and these are most exceptional. So little was known of them, that those lately worked were brought before the public on the plea that the silver ores had been thrown away by the former workers, as they were unacquainted with them, and some stones, not tons, containing as much as 3000 ozs. per ton were assayed. By mere accident, a scientific gentleman of high repute was the first to detect this ore in the Old Treburgett Mine.

What is a practical miner, in the first place? A man who has been brought up from youth to copper or tin mining. This would simply make the man a thorough practical copper or tin miner; but that knowledge can never qualify him as a judge of silver, gold, quicksilver, bismuth, antimony, or any other mines. This is what the general public in England do not care to investigate, or do not know the importance of so doing. If a practical copper or tin miner is sent abroad to manage a copper or tin mine (provided he is not required to know assaying or the metallurgy of these two metals) he will be the right man in the right place. But if the wrong men are so employed, collapses must take place such as those lately; and if such continues to be the case, English companies in California and America must suffer in their mining interests.

We have some good English silver miners, but these have lived abroad for years, and have become consequently acquainted with practical silver mining. However, this does not include the metallurgy of this metal, which is one of the most difficult of metals to reduce out of its various chemical combinations. I may here mention the name of one of these—Capt. J. Nancarrow, of Liverpool, who is a practical silver miner, and was in Chili for years.

A copper or tin miner is seldom or ever asked if he knows anything of silver or any other class of mining. He is sent abroad because he is a thorough practical man. In which branch of mining? This does not signify, he is never asked the question. But woe be to him if no dividends are forthcoming, from a class of mine he had never before seen. It is only when too late that this practical man is turned inside out and examined; too often too late to remedy "mistakes," as Mr. Bowe calls them, by patching up or bolstering a concern.

I am, with some friends, working some quicksilver mines in Spain. Had I not better take a leaf out of the experience of some foreign mining boards, with their practical men, and send out to Spain a thorough practical tin miner to manage these quicksilver mines, and their metallurgy?

I have already in previous letters referred to the great fault of public companies never investigating the competency of their practical men before employing them. HENRY SEWELL.
40, *Blomfield-street, Upper Westbourne-terrace.*

MINING IN NEVADA.

SIR,—Permit me to reply to Mr. Bowe's letter, which appeared in the Supplement to the Journal of Jan. 7, and in which my name figures rather prominently. It is true I was selected to report and advise upon the purchase of Bateman's Eureka, or Buckeye, and Champion Mines, and for that purpose I arrived at Eureka on the 18th of March last. I was accompanied in the inspection by two mine agents, and not one, as stated in the said letter. We found the mines comparatively poor. In the Buckeye four shafts were sunk, about 10 fms. apart. The ore deposit in three, out of four, was worked out; in the fourth there was a pipe of ore 5 ft. in diameter, which consisted of ordinary blue lead ore, and was the richest portion of the mine; this was within 30 ft. of their boundary. We broke a large quantity of stuff from the selected and rich portion of the lode, but the assays were most unsatisfactory. The Champion was a mere surface deposit, and several feet sunk on what was termed the lode proved it to be valueless. We were three days inspecting the pro-

perty, and all three of us were unanimous that it was not worth the money asked for it—50,000*l.*; the local price for Buckeye was 6000*l.*, and Champion 1500*l.*; and the owners were anxious to complete the sale on those terms. Statements have been made as to the great improvement that took place in the mine afterwards; but one of the owners of Buckeye tells me that all they could get for both mines about four months after I left was 20,000*l.*, and they had to allow 2000*l.* as commission off that amount. Now, the public can judge for themselves whether we were justified in giving 50,000*l.* for a property which was first valued at about 8000*l.*, and in four months afterwards was sold for less than 20,000*l.* I should state I was limited to time, and could only speak of the mines as I found them. The writer's statement that whole districts are injured by an individual mine being reported against is mere twaddle. I hold the opinion that Nevada is a rich mining country. I had ample evidence of this in various parts of the country, particularly at Mineral Hill, where I was introduced to the owners of the rich silver mines there. I was also at Salt Lake, and, from information received from "practical men," had no doubt rich mines were being opened in that district. I went down to California and inspected Sweetland Creek, and recommended that valuable property. I was also underground in many valuable mines in Grass Valley district, particularly Eureka, and had I the command of means and time could have made an immense fortune, but I was tied to definite orders from London.

I have visited most of the mining districts in the United Kingdom, and travelled every quarter of the globe on mining business, but never inspected such a rich mineral country as that included in my journey to Nevada and California. F. EVANS.

Newtown, Montgomery, Jan. 17.

[For remainder of Original Correspondence see to-day's Journal.]

IDAHO TERRITORY, UNITED STATES—No. III.

Attention has already been directed to the extraordinary richness of some parts of this territory in precious metals, and the magnitude of the veins of silver which are found in the Middle Boise district, and more especially at Atlanta. The discovery of the mineral wealth of Owhyee, same territory, preceded that of Atlanta—indeed, the latter place is so new a country, that to many residents in the Eastern States it was scarcely known, until the report of Commissioner Ross Browne called attention to the richness of the district, and, to what is next in importance, the natural facilities for working the ores on the spot. It is to the latter subject that attention is more particularly directed.

Most of the lodes hitherto discovered in the Atlanta district are so situated that they can be worked by adits or tunnels, without the necessity of sinking shafts, thus not only saving vast expense in raising the ore to surface, but also affording the readiest method of getting rid of water without pumping.

The Atlanta Silver Mine, recently examined by Capt. Nancarrow, of Redruth, has its present working tunnel about 350 feet from the summit of the mountain, but can be opened 800 feet deeper by an adit before coming to the water level.

The Middle Bois river, a fine stream of water, affords power to an almost unlimited extent, while on its banks there are numerous sites peculiarly well adapted for the erection of quartz mills.

A feature of the Atlanta basin, and one very common in the territory, where exist many indications of volcanic action, is the hot springs which burst out from the foot of an adjacent mountain. Some portion of this hot water is conducted into the canal which supplies the Monarch Company's mills with motive power, keeping it open during the severest frost, while the great bulk finds its way into the river, preventing its freezing during the winter, as it flows westwards towards the Pacific Ocean. This is of very considerable importance, and allows mill operations to go on during the winter, without having the expense of steam for propulsion of machinery.

The next point of importance is the vast and inexhaustible supply of wood for building operations and for fuel. The finest kind of timber and firewood cost nothing more than the expense of cutting and hauling. The Monarch Company, the owners of the Atlanta Silver Mine, who appear to have taken the cream of everything, which as pioneers, of course, they would do, have secured a park of timber of 350 acres, which will afford a perennial supply of wood for all purposes. It would appear that nature has supplied, in the greatest profusion and on the spot, the very materials required for making the wealth of the country available.

It will, no doubt, be acceptable to many readers of the Journal to know what is the particular character of the ores of those portions of Idaho which have been prospected. The Owhyee district, in western Idaho, is chiefly remarkable for its gold, both in placers and in quartz veins. Some very promising discoveries of silver ores, however, have been made in the neighbourhood recently.

The district known as the Boise Basin, including Idaho city, Placerville, Centreville, and Orogrande, and also the Snake River valley, abound in placer gold, the origin of which can mostly be traced to the neighbouring mountains.

In the south Boise district, of which Rocky Bar and Red Warrior are the centre, there are many rich gold-bearing lodes, some of them being worked by the common old-fashioned Spanish arastra, and yielding very good returns. Here, as elsewhere in the territory, and probably in every new country, the great want is capital to put up machinery and properly develope the mines. It is the early investors who will reap the great return. It cannot be long before money will find its way into the district; indeed, it is beginning already to flow in, for three years ago ordinary rates of interest at Rocky Bar were 4 and 5 per cent. per month, now they are 3 and 3½ per cent.; while the opening of the Union Pacific Railway has already reduced all provisions 30 per cent., and wages in equal proportion.

The character of the ore in the Middle Boise district, particularly as exemplified at the Atlanta Silver Mine, with the actual results of its mill operations, as well as assays made both in Idaho and London, will be given in a future number.

SUBMARINE ROCK DRILLING.—Gen. Newton, now engaged in the work of blasting away the extensive submarine ledge of rocks known as Diamond Reef, situated near Governor's Island, in New York Bay, has, with great ingenuity, overcome the difficulty of drilling submarine rocks from a floating platform anchored above. The use of a coffer-dam or a caisson is impracticable at Diamond Reef, in consequence of the violent action of the tides, which sweep away every obstacle. The muddy water also prevented the divers from working, and all other known plans failed completely. Gen. Newton at last devised the following method of operating:—A large and strongly-built scow, 140 ft. long, and 50 ft. wide, provided with overhanging guards and lifting apparatus driven by steam, was constructed and moored over the rocks in the exact position, by heavy chain-cables, hawsers, and ponderous anchors. In the centre of the scow was placed a well-hole, through which, by means of powerful derricks, an iron dome, 30 ft. in diameter, and weighing 70 tons, was lowered down into the water, where it rested evenly upon the rocks by means of adjustable legs. The divers then descended, and worked under the protection of the dome, directing the steam drills and the other instruments, which are similar to those used in the coal oil regions. While the water at the surface boils and rages, below the dome the current, although strong, is steady and clear. Each drill is operated by a separate engine, and the agitation of the water washes out the fragments of the rock from the hole. The average progress made in drilling is 1 ft. per hour. For the last month the work of drilling Diamond Reef has been going on, and nine holes, each 11 ft. deep and 4 in. in diameter, were bored. Into each of these holes a charge of 30 lbs. of nitro-glycerine, enveloped in two-ply India-rubber pipe, 2½ in. in diameter, and 7 ft. long, was inserted. A copper wire, 1000 ft. long, heavily coated with gutta-percha, was attached at one end to a powerful Leyden jar battery, and at the other end was connected with the charges by means of wires and fulminating pods. A few days ago these heavy charges, forming in the aggregate 270 lbs. of nitro-glycerine, were exploded, and the quantity of rock moved corresponded to the immense force of the substance.—*United States Railroad and Mining Register.*

COAL IN NEW MEXICO.—The *Cimarron News* says: "In addition to the other sources of wealth which give so much promise for the future of our territory, coal in abundance has been found on the Maxwell Grant. In the Ratoon Mountains, along the Red River and on the Yermejo, there are large and distinct beds, some of which are 10 ft. thick or in depth. The coal is bituminous, and of the best quality to be found on the Continent. Also on the Ponniel Creek large veins crop out all along the mountainous course, whose quality excellent judges pronounce unsurpassable. Along the Cimarron River there are also well-defined evidences of large coal beds, but as yet the company have not had time to open them. Indeed, the grant is permeated with beds of coal, which crop out at different places. The blacksmith at Cimarron uses it for all his purposes, and says it answers as well as charcoal. A family residing near Cimarron use it for cooking purposes, and they, too, say that its quality is excellent, and they prefer it to wood."

THE MINES REGULATION BILL.

A meeting of the committee appointed to watch the Mines Regulation Bill in Parliament met at the Royal Hotel, Truro, on Friday, Jan. 13, Mr. Bruce having intimated his intention of re-introducing the Bill in the coming session, and to press Clause 7, which would apply the Workshop Regulations to mines. Mr. T. S. BOLITHO presided, and the gentlemen attending were Messrs. J. St. Aubyn, M.P., A. Pendarves Vivian, M.P., H. Rogers, J. Haye, P. P. Smith, R. Rogers, A. C. Willyams, T. Cornish (secretary), S. T. G. Downing, H. S. Stokes, S. Heard, R. Grylls, Rawlings, S. H. James, W. Shilson, Marrack, Captain Retallack, Marrack, W. H. Davey, Sampson, Boyns, &c.

Mr. T. CORNISH read a number of letters from gentlemen who could not attend.

Sir JOHN S. TRELAWNY wrote: You may be quite sure that I shall pay the closest attention to any decisions to which the committee may come, and endeavour to co-operate with my colleagues in doing the best the case admits of. In a few days I am due in London to continue my work on the Royal Commission on Contagious Diseases, and arrangements rather complicated the manner of laying my time. I shall be at the disposal of the committee at all times after my arrival in town.

M. R. N. FOWLER, M.P., wrote: It will give me much pleasure to support Mr. St. Aubyn and the other Cornish members in any course which may promote the interests of the county.

Mr. R. H. WILLIAMS wrote: Nothing definite in respect to the Education Bill has been arrived at for the St. Austell district. I feel assured Mr. Bruce's Clause 7, in its original form, will throw out of work half the children now employed in our mines, not on the ground of their present state of education, as nearly all the children employed can read and write, but because the work of the mines cannot be carried on conveniently to allow Mr. Bruce's 6½-hours scheme to act.

Mr. F. HILL, Helston, wrote: I think it very improbable that Mr. Bruce will consent to expunge Clause 7 from his Bill. We should obtain some modification, and if Mr. Bruce will accept the proposals made by you last year we may be content to accept 48 hours in the week, and allow us to include Sunday and evening teaching. We shall scarcely do better.

Mr. W. POLKINGHORNE, Par, wrote: As far as I understand matters at present, the following is the position of the Educational question in the parishes named:—Tywardreath: The boundary principle is resolved on; a committee of seven has been formed to act with the four managers of the national schools. Application is made to Government for a grant to enlarge the said schools, in order to have, with the other schools in the parish, sufficient accommodation, as required by the Act.—Fowey: A School Board is requested.—St. Blazey: It is resolved to have a School Board, not being able to carry out the voluntary principle.

Mr. C. CHILDS wrote: Mr. St. Aubyn, in his speech at Helston, explained the bearing of Clause 7 on our Cornish mines in language so forcible, plain, and clear, that it would be idle, if not presumptuous, to add one word to the opinion he has so well expressed, and the advice he has so generously given. I venture to hope that Mr. St. Aubyn will not be disappointed in his expectations to receive formal authority to oppose the introduction of Clause 7, and that the committee will, by a unanimous resolution, decide that every effort shall be made to have this objectionable clause expunged, at least so far as it may have any bearing on metalliferous mines. As to the Elementary Education Act, no decided steps appear to have been taken in this neighbourhood, beyond this that in some parishes efforts are being made to carry out the requirements of the Act by voluntary contributions, without resorting to the election of School Boards, but unless Parliament should confer on the committee of schools to be conducted on the voluntary system powers to make bye-laws for the compulsory attendance of children, I do not see how the meaning and intention of the Act can be carried out except by a School Board to be elected for each parish or district.

Mr. G. L. BASSETT telegraphed from Camborne that owing to a mistake in a time-table he had missed the train.

The CHAIRMAN explained that at the last meeting of the committee, held on May 7th, 1870, it was resolved that the whole of the clauses, excepting clause 7, as then amended, should be accepted. Therefore, he thought they need only now discuss clause 7. With regard to this clause, a sub-committee, or deputation, was appointed to wait on the members in London. They had several consultations, and were assisted by Sir John Trelawny and Mr. Brydges Willyams, and by several of the borough members, especially by Mr. Magniac, of St. Ives, and Mr. Young, of Helston. They came to the conclusion that it was not likely that Mr. Bruce would consent to strike out clause 7, and they made an offer through the members to accept a clause to the effect that no child should be allowed to work unless it could read, believing that if a child could fairly read its subsequent education must go on. Mr. Bruce said he could not assent to it, but would accept a clause to the effect that no child should work at all that could not read, write, and do the first four rules of arithmetic. The deputation thought that it was very unlikely that any very large proportion of the children between the ages of 11 and 13 could pass an examination in the first four rules of arithmetic; and then they made an offer—which if time had admitted they would have liked to have submitted to the committee—that they would accept clause 7, modified as follows:—The clause under the Workshops' Act would enforce that no child under 13 years of age should work more than 6½ hours a day, not to work after two o'clock on Saturdays, and on Monday mornings to bring a certificate that it had received ten hours' schooling in the previous week, exclusive of teaching on Sunday, or after six o'clock on any evening. The deputation authorisation the members to accept a clause providing that the children should not work more than forty-eight hours a week—not eight hours a day, but distributed as they liked—and the ten hours' schooling to include attendance at Sunday or evening schools. Mr. Bruce intimated that he would not object to the modification, but could not answer that the House of Commons would accept it. They knew, however, that Parliament had many other important measures to deal with, and the Bill was withdrawn. Recently Mr. Bruce had informed Mr. Vivian, M.P., that he should re-introduce his Bill this session precisely in the same shape, and it was thought advisable to call the committee to instruct the members as to the course which should be followed.

Mr. ST. AUBYN mentioned that last year when they found that they could not carry the exclusion of clause 7 altogether, they cast about for the next best thing, and they agreed to the compromise contained in the following amendment, which stood in his name:—"From and after the 1st of July, 1872, no child under the age of 13 shall be employed above ground in connection with any mine other than a coal mine for more than 48 hours in one week, and the following regulations shall be made (subject to the provisions hereinafter mentioned) respecting the education of children employed above ground in connection with any mine other than a coal mine:—1. Every child who is employed as aforesaid shall attend school for at least 10 hours in every week during the whole of which he is so employed.—2. In computing for the purpose of this section the time during which a child has attended school, there shall not be included any time during which such child has attended either (*a*) in excess of three hours at one time, or in excess of five hours in one day, or (*b*) on Sundays: Provided, that the non-attendance of any child at school shall be excused; (1) for any time during which he is certified by the principal teacher of the school to have been prevented from attending by sickness or other unavoidable cause; (2) for any time during which the school is closed for the customary holidays, or for some other temporary cause; (3) for any time during which there is no school which the child can attend within one mile (measured according to the nearest road) from the working place or the residence of such child." The workshop Act provided that no work should be done by the child before eight in the morning or after six in the evening, and it was felt that under certain conditions of pressure of work at the mines this would be extremely injurious. They did not propose the compromise because they thought it best suited to the circumstances of the case, but because they had no other choice between that and the adoption of the 7th clause.

Mr. VIVIAN, M.P., observed that knowing the question would be mooted whether Mr. Bruce would insist upon introducing education in the Mines Regulation Bill, he, being on friendly terms with the Home Secretary, wrote telling him that it was considered in Cornwall to impose on mine children what was not proposed for children on farms would be very injurious and exceptional legislation, and trusted he would not press it in the next Bill. Mr. Bruce replied, that having talked the matter over with Mr. Foster, his suggestion of leaving to the operations of the Education Act all children not at present included under the Factory Act, he feared it would not do, as he did not intend to drop the Cornish mine children out of the Bill, he did not see that he could accept any other proposition than that contained in the Bill. Still he (Mr. Bruce) would be open as he was before to consider any adequate counter proposition he, or any other Cornish M.P., could make. His (Mr. Bruce's) reasons for thinking the provisions of the Education Bill inadequate were—first, that compulsory education could not be applied unless a School Board were formed; secondly, that in many districts no School Board would be formed; and, thirdly, that the School Board when formed may decline to make any provisions for the education of children at work—their doing so would be optional, and they would be slow to act against the prevailing opinion which may be adverse to any form of half-time or limitation of hours. This year he (Mr. Vivian) thought they stood in a better position, in consequence of the passing of the Education Act, but Mr. Bruce having talked the matter over with Mr. Foster, who, it seemed, agreed with him was not an advantage to them, for since Mr. Foster's conduct of the Education Bill he had obtained great influence in the House. Last year the coal interests were decidedly against clause 7, and he knew that the South Wales district and the metalliferous mines of the country would be with them. But the coal miners were decidedly in favour of the clause, and this year would, as they were last, be represented by Lord Elcho.

Mr. ST. AUBYN, M.P., observed that last year the metalliferous mining interest out of the county worked harmoniously with them, for the clause would be just as injurious to them as it would be to Cornwall. It was for the meeting to say what the members should do with the Bill next session. All that Mr. Bruce had said would apply with equal force to children employed in agriculture. The passing of the Education Act last year had placed them, he thought, in a much stronger position, for that was an Act to give education to every child in the kingdom, including mining children; and, that being so, he thought it would be best to urge that there were no conditions connected with the employment of children on mines, either as regards to health or hours of labour, which called for interference on the part of the Government. Taking this broad and simple line of argument, in proposing a simple negative to clause 7 they would have a much better chance with the House than in opposing one set of regulations with another. The House, as a body, was not familiar with these questions, and they would be able better to understand a clear and simple argument of that nature than a comparison of two sets of regulations. It was for the committee to instruct the members, but he could not help saying that he thought they would have a very fair case to put before the House of Commons on general grounds, and with the facts and figures with which they would be supplied in opposing clause 7 altogether. (Hear, hear.) Following such a course would, in his opinion, be most likely to end in success. Mr. Bruce's attention had been called to the unfairness of dealing with mining children and leaving out the agricultural children, and his answer was that they were not in the same category; and that the mining children they could catch, but they could not the agricultural, because they were so continually moving about.

The CHAIRMAN was agreed that the Education Act had placed them in a better position, for they could say they entirely approved of what had been done, and thought that the mining children should be included in it.

Mr. ST. AUBYN observed, in answer to a remark that Mr. Forster was likely to oppose them, that he had only heard one side, and was a fair man and not obstinate.

Mr. RAWLINGS said that in the foundry with which he was connected it was clearly shown that children under 13 years of age could not be employed under the Factory Act. Most of the children employed were orphans, or had old, infirm, and crippled parents; but the regulations were so impracticable that the majority of them had to be dismissed, except a few they had not the heart to send away, and for these a clerk had to be employed to see to their attendance, &c. The inconvenience, too, to the men of the children working one part of the day and not another was very great, and it was a question whether, if the clause was adopted, the mines could employ any children under 13, as the work of the men depended so much upon that of the children.

Mr. VIVIAN could bear out all that Mr. Rawlings had said with regard to the impracticability of employing children under 13 where the Factory Act or the Workshops' Act applied. In some cotton-rolling mills with which he was connected they tried to keep the children, but found it impossible to do so, and ultimately had to dismiss all under 13. It was of far more importance in the mines of Cornwall, because skilled cotton-rollers earned 3*s.* 6*d.* or 4*s.* a day, whilst the wages of the Cornish miners were 20 to 30 per cent. below this.

Mr. H. ROGERS entirely agreed with Mr. Rawlings as to the effect that would result from the clause, and any compromise upon it would be very objectionable. Capt. Quentrall had told of a man working at Trumpet Consols who had eight or nine children; his wages averaged 3*l.* 7*s.* per month, and three of his children, working at one of the stamps, earned 3*l.* 8*s.* a month. No compromise of the clause would allow them to continue the services of these children, and the father would lose 30*s.* a month. But the loss would not fall on the adventurers, for they would employ a big boy, or "half a man" as they called him, at 2*l.* a month, and he would do the work of the three children, so that the adventurers would only lose 10*s.* a month, whilst the ratepayers and the parents of the district would lose the 30*s.* formerly received by the children. With the proposed regulations he saw no chance of continuing to employ children under 13 on the mines. He agreed that the passing of the Education Act had placed them in a much stronger position. Having taken a great interest in the matter, he was in favour of School Boards everywhere, except in some isolated places, where wealthy persons were quite ready to take the schools under their own management. His suggestion would be that Clause 7 should be expunged, except where no School Board was formed; for School Boards could compel the attendance of children, and also had the power of exempting children from attendance at school from poverty or other reason. With that he thought Mr. Bruce should be satisfied.

Mr. SMITH showed how the loss of the children's labour would fall eventually on the ratepayers, and observed that it would be very easy for the members to convince Mr. Bruce that there was no analogy between the work done in the close dense atmosphere of the workshop and that done by the Cornish children in the open air on the mines. He had the greatest confidence that the members could satisfy Mr. Bruce that the clause ought not to be inserted in the Bill.

The CHAIRMAN said that the employment of children on mines had much to do with that important question—technical education—so much talked of last session, for children who began before 13 on the mines became good miners.

Mr. ST. AUBYN observed that it would be easy to show that the work done by children on mines was more allied to agricultural work than to work in factories or workshops. Coal mines might require some such interference, for their children worked underground, which was not the case in Cornwall.

The CHAIRMAN mentioned that the coal miners were in favour of the clause, because the prohibition of children's labour would tend to increase men's wages.

Mr. ST. AUBYN said after the passing of the Education Act the *onus probandi* would thrown on Mr. Bruce, that the condition of the mining children was such as to require some special legislation. Upon that ground he thought he and the other Cornish members could meet him.

Mr. RAWLINGS: I do not think Mr. Bruce would introduce a clause the effect of which certainly will be to throw all the children under 13 out of work. Has this been put to Mr. Bruce?

Mr. ST. AUBYN: Yes; and his reply is that this was said of the Factory and Workshops Act, and that it has not turned out to be the case.

The CHAIRMAN believed Mr. Bruce was incorrect in saying so.

Mr. BOYNS showed that the miners of St. Just were opposed to the introduction of clause 7, which would undoubtedly throw their children out of work, and that every endeavour was being made under the Education Act to give every child instruction.

The following resolution, proposed by Mr. H. ROGERS, and seconded by Mr. RAWLINGS, was carried unanimously:—"That this meeting considers the operation of Clause 7 in the proposed Mines Regulation Bill would be unnecessary and injurious, and that the county and borough members be requested to use their utmost endeavours to expunge such clause altogether."

The CHAIRMAN mentioned that he had received notice of a meeting at St. Austell next week, when Mr. Roger would bring forward once more the question of the rating of mines; and he further stated that the Mines Assessment Committee had not been called together in 1870 because the Bill on the question had not been introduced into the House, but now Mr. Goschen had promised a Bill which would deal with the question generally, including mines. When that Bill was brought in he, as Chairman, should call the committee together.

Mr. H. ROGERS wished such a meeting to be public, and to consider other matters in connection with it. There was a very great dissatisfaction, not only as regards the rate of dues that were charged on miners, but there was an indirect attempt on the part of some of the lords' agents to throw the rates upon these dues upon the adventurers, instead of confining them to the lord himself. More than three gentlemen in the room had apprised him of the attempts of some lords to dictate as to the management of the mine, and that clauses for that purpose were sought to be introduced into the leases. With great regret he had learnt, also, that some lords had even sought to dictate as to the wharves at which the mines should get their goods. He resented this arbitrary and dishonourable interference with adventurers, and would call a public meeting, if no one else would. A clause should be introduced into a Bill, as in the property tax, which should give the adventurers power to deduct the tax on lords' dues.

Votes of thanks to the members of the county for their services, and to the Chairman for presiding, were passed.—*Western Daily Mercury.*

SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE INSTITUTE OF MINING ENGINEERS.

The fourth annual meeting of members was held on Monday, in the Museum of the Dudley Mechanics' Institute, Mr. William North presiding. There was a good attendance of members, including Messrs. J. Cooksey, T. Checkley, Thomas Parton, F.G.S., W. Greenway, W. Blakemore, R. Evans, J. P. Haynes, J. Hughes, W. Spruce, G. Spruce, J. Randall, F.G.S., D. Jones, F.G.S., H. Johnson (hon. secretary), and H. Johnson, jun. (assistant secretary).

After some formal business the hon. SECRETARY read the report, which commenced by congratulating the members upon the success of the Institute, which at that time numbered 153. During the year the Council had been successful in making terms with the Dudley Mechanics' Institute and the Dudley and Midland Geological Society to rent the splendid museum in which the members then sat, and all the meetings would in future be held there, instead of at Wolverhampton, Walsall, and Dudley. The report also stated that, at the invitation of, and in co-operation with, the Mining Association of Great Britain, considerable attention had been given to Mr. Bruce's new Mines Inspection Bill, proposed for legislation during the last session of Parliament. Should the Bill be again brought forward, the important changes which it proposed to bring about would have to be watched with the greatest possible care. The Council called the particular attention of the members to the endeavour to discover coal beyond the present confines of the South Staffordshire coal field. It was pleasant to look back to that day twelve months, when the sinking at Sandwell Park was suggested. That sinking was now a fact, and the permanent shaft was nearly 50 yards deep. The attention of the Institute members had also been given to the probability of a similar sinking between the South Staffordshire coal field and the Shropshire coal field. Several discussions had taken place on the subject, and the Council recommended the collection of all possible information relative to the two faults bounding the vast region on the east and west sides, and the pursuance of the subject until by some means or other a trial shaft or bore-hole is put down between the two fields. The report then referred to the pleasurable nature of the trip to Belgium and Wales, and trusted that the excursions in the future would be equally well attended. The best thanks of the Institute were due to M. Jochams, the Government Chief Officer of Mines, to the local Government Inspectors of the several districts visited, and to Mr. Scott, companion and interpreter to the Belgian excursion. Visits to such places were of the greatest importance, and would do much to instruct the younger members of the profession. (Hear, hear.)

The Hon. Sec. read the balance-sheet of the Institute, which showed that there was a balance in the bank, after paying all expenses, of 400*l.*

Mr. Cooksey (West Bromwich) was elected President, Mr. Checkley vice-President, Mr. Latham treasurer, Mr. H. Johnson, sen., was re-elected honorary secretary, and Mr. H. Johnson, jun., assistant secretary. The following were elected on the council:—Mr. W. North, Mr. Thomas Brettell, Mr. J. M. Fellows, Mr. F. Smallman, and Mr. J. Brown.

Mr. Cooksey then took the chair, and Mr. Getting and Mr. Williams, of Wednesbury, were elected members of the Institute.

A vote of thanks was given to the retiring President, Mr. William North, who suitably responded.

The newly-elected PRESIDENT, after reviewing the work of the year, then opened the adjourned discussion on Mr. Parton's paper, "Is there Coal between South Staffordshire and Shropshire?" He said Mr. Parton's paper led them to the conclusion that there was coal in the locality indicated. The discussion on his paper at the meeting of the Institute in December last appeared to diverge from the question to an enquiry into the character of the fault which formed the western boundary of the South Staffordshire coal field, but the question in reality hinged a great deal upon this enquiry. If the western boundary fault was a clean cut, or a succession of clean cuts within a short distance, it led to the conclusion that the South Staffordshire coal field had been lifted far above its former relative position, leaving a part of the coal measures with which it was formerly on the same horizon far below it on the western side of the fault, where they are still covered by an immense thickness of Permian rocks, and the beds comprised in the New Red Sandstone series; whilst denudation had brought the surface of the earth down to the level of their series of coal measures, and placed them within easy reach. Looking at the anticlinals which formed the Lickey Hills at the southern extremity of their coal field, the Netherton Hill and Dudley Castle, Wren's Nest, Hurst and Sedgley Hills, as well as to the numerous eruptions of trap or igneous rock found in various places all over the district, it could hardly be doubted, he thought, that the whole area of their coal field had been subjected to a great upheaving force, and his conclusion upon the matter

was that by such force it had been separated from similar measures which still had an existence beneath some parts of the area of the Red Sandstone lying between the Shropshire and Staffordshire coal fields.

Mr. JOHN RANDALL, F.G.S., said that Mr. Parton had represented in a fair light the opinion held on both sides of the question. He presumed that they were not there for the purpose of advancing any dogmatic theory they might hold on the subject, but of exchanging views and collating certain information which had come within their grasp. (Hear, hear). That there did exist more coal, and a greater quantity of minerals, beneath the Red Sandstone rocks of the Midland Counties he thought very possible, if not probable. Some, however, had taken very sanguine views of the matter, and those views, he feared, had tended to lead persons astray. For instance, they had read the statement made by Mr. Smythe, in which he drew a very tempting picture of the mineral resources of the district lying between there and Shropshire. He took them to the top of the Wrekin and showed them the mines, works, and forges lying in the immediate foreground, and, he said, cross to the Red Sandstone district to their forges and mines; and no man, he maintained, looking at the district, looking at the nature of the measures on both sides, and looking also at the fact that those measures on both sides reposed on the same denudated rocks, and were covered by the same Red Sandstone, no miner could well despair of finding coals through the intermediate districts. Others had gone further, and had actually mapped the measures lying between these two districts as fixed, excepting, indeed, that they were disconnected by force. When he said this he meant that it was not anticipated that they should ever find a continuous coal field. In his opinion, however, the coal measures of the two districts were formed at one and the same time. They might, moreover, take the districts of South Wales, of the Clay Hills, and others, and they might safely conclude that the whole of them were formed at one and the same time. If these coal measures were continuous over the wide district he had mentioned, many changes, and extending over long periods of time, might have operated to produce the effects they had witnessed. They found indications of denudation not only at several distinct periods during the formation of the coal field itself, but also anterior and subsequent to those formations. In South Staffordshire, for instance, they had coal measures resting upon old Silurian limestone, just as they did in Shropshire, but between the formation of the Silurian limestone and the deposition of the first bed of the coal measures look, he said, what a vast period of time must have elapsed. If they compared one class of animal remains with the other it would show what a tremendous gap existed between those formations; it was like carrying back the reign of Victoria to the time of the Conqueror, or the Heptarchy. Referring, again, to the Old Red Sandstone, he saw it was continuous, without a break, all the way to the South Wales coal field. It extended, no doubt, over the whole of that district, and the whole of it had been denuded. Those coal fields of Wales and Staffordshire were originally one vast track, which had been subjected to the same denudating agencies, but he did not mean to say that the denudating of those extensive tracks took place at one time. That, however, was a subject which he thought they did not yet thoroughly understand, and it was one of the most important which that, or any other, Institute could take up. It would bear further investigation, and it was very likely that they would find reason to suppose that denudation had taken place at several distinct periods, and left the effects which they deplored. They found not only that the old coal measures had been planed down, as it were, but they found a newer series of coal measures, formed upon the edge of the old coal field. From that circumstance it would appear that the old series of coal measures had been completed, and covered up; that denudation took place, and that there was then a subsequent formation of coal measures. There was a younger group formed upon the foundation of the old coal measures, extending sometimes through one, sometimes through another, and sometimes through the whole series of measures. There was evidence of denudation, and he thought after that younger series of coal measures were formed that denudation again took place, and that to a very large extent. Well, they could readily understand, that supposing a vast body of water came from the south or the south-west, it must have gone very far in between the two coal fields. He thought they had much reason to fear that the ravages of that body of water must have extended very far in the direction of the South Staffordshire coal field. He had never pretended to say that coal might not be found outside their present boundary, but he considered it doubtful indeed that it would be found to any great extent. The time, however, had not come to dogmatise on the subject. (Applause.)

Mr. JONES, F.G.S., in an explanatory speech, described the different coal fields on the map of the Institute, and agreed, to some extent, with Mr. Randall, and in a great measure with Mr. Parton in his paper.—The discussion was then adjourned.

The PRESIDENT said the time was too short to describe fully the progress of the sinkings at Sandwell, but he had full authority to say that everything was as satisfactory as could be wished.

Mr. H. M. MORRISON, M.E., of Manchester, read a short paper, descriptive of dynamite, or safety blasting-powder." Samples were handed round among the members whilst the paper was being read. The reader said the credit of the discovery was due to M. Alfred Nobel, a Swedish mining engineer, who had taken great interest in mine blasting. Dynamite consisted of silica saturated with nitro-glycerine, which was its explosive basis. Mr. Morrison also exhibited and explained a model of Messrs. Davies and Thomas's patent pulley and winding engine-house frames combined, showing a new mode of coal-winding, by which one rope suffices for two pits.—Messrs. McDermott and Williams's coal-drilling machine was exhibited, and received commendations from several members.—Mr. Richard Latham, a member of the Institute, exhibited a lithographed section of extensive explorations after the Thick coal, at Lord Dudley's No. 33 Pits, at the north-east of the basaltic range of the Rowley Hill. The section completely illustrated the effects of igneous action and the intrusion of trap into coal measures.—Mr. Lindop exhibited specimens of iron-stone and fire-clay from a depth of 307 yards, at the trial sinking, Coppy Hall Colliery, Aldridge, near Walsall.

The members of the Institute, 50 in number, dined at the Dudley Arms Hotel.

GEOLOGICAL SOCIETY OF LONDON.

Jan. 11: JOSEPH PRESTWICH, F.R.S. (President) in the chair.

William Salter of Maldon, Victoria, Australia, was elected a Fellow of the Society. The following communications were read:—

1. "On the older Metamorphic Rocks and Granite of Banffshire," by T. F. Jamieson, F.G.S. The author indicated three divisions in the metamorphic strata of Banffshire. At bottom a great thickness of arenaceous beds, more or less altered into quartz rock, gneiss, and mica schist; next a series of fine grained clay-slates, in the midst of which is a bed of limestone; and then again an upper group of arenaceous strata. The author stated that the arrangement of the rocks is very similar to that occurring in Bute and Argyllshire. He remarked that the general texture of the beds is fine grained, and considered that they were probably deposited in the depths of the sea, off the mouth of a great river, the deposition of the argillaceous strata having taken place during a period of increased depression. The deposition of the beds was said to have probably taken place after the formation of the (Cambrian) Red Sandstone and conglomerate of the North-West Highlands, or in Lower Silurian times the river by which the sediment was brought down being supposed to have drained the great Laurentian region to the north-west. After their accumulation the author supposed that "a glow of heat from beneath" approached them, causing expansion and the wrinkling of the mass into folds running from south-west to north-east. The granites were considered by the author to owe their origin to the fusion and re-crystallisation of the arenaceous beds.

Prof. RAMSAY observed that the general section wonderfully corresponded with that given many years ago by Sir Roderick Murchison of the Silurian and Laurentian rocks at Cape Wrath, and it seemed to him that the large views originally propounded by Sir Roderick were confirmed by the author. He was glad that the metamorphic origin of granite was supported by Mr. Jamieson, as he had held that view for several years, and he was pleased to find that opinions which had formerly met with so many opponents were constantly gaining acceptance. The fusion of these sedimentary rocks by metamorphic action was not identical with the fusion of lava, but their fluidity might be the same; and if that were the case there could be no difficulty in accepting the possibility of the injection of such fused rocks into crevices and fissures. The crumpling of the beds, however, was due to more extensive causes than those contemplated by the author. The proportion of igneous rock injected into contorted rocks, like those of North Wales, was almost infinitesimal, and the crumpling could hardly be due to mere local causes.

Prof. ANSTED referred to what he had observed in the north-west part of Corsica, where about 40 ft. of granite was distinctly inter-stratified between perfectly unmetamorphosed beds of sand-tone and limestone, without any alteration at the points of contact, such as would be produced by an igneous rock. He also cited the crumpled strata in the Maritime Alps, in which the granites were parallel with the other beds, and seemed to form part of them.

Mr. CARRUTHERS mentioned that the late Prof. Fleming, twenty years ago, had taught the same doctrine as to the nature of granite as that held by the last speakers.—Mr. DAVID FORBES agreed that the crumpling of the strata was not due to the intrusion of any eruptive rock. He completely disagreed with Prof. Ramsay and the author as to the origin of granite, and maintained that in the sedimentary rocks traversed by the granite the requisite ingredients for the formation of granite did not exist. The proportion of felspar in quartzose rocks was infinitesimally small as compared with that entering into the composition of granite. He could not accept the notion of the heat from the interior approaching gradually to some portion of the surface.

Prof. RAMSAY, in reply to Mr. Forbes, maintained that some of the slaty rocks of Wales, by extreme metamorphism, would pass into some kinds of granite. As to the conditions of metamorphism of the rocks, this process must have gone on at a time when these older rocks were overlain by a great thickness of more recent beds, which have since been removed by denudation.

2. "On the Connection of Volcanic Action with Changes of Level," by Joseph John Murphy, F.G.S.

3. "On some Points in the Geology of the Neighbourhood of Malaga," by Don M. de Orueba: communicated by Sir R. I. Murchison, F.R.S., F.G.S.

MINING IN CALIFORNIA—DIVIDENDS AND MINT MATTERS.—The Meadow-Valley Mining Company have declared their second monthly dividend at $1·20 per share, amounting to $90,000. The Hale and Norcross Mining Company have declared their regular monthly dividend of $5 per share. The Chollar-Potosi Mining Company have declared a dividend of $5 per share, amounting to $140,000. Up to and including July, the dividends of the company were at the rate of $1 per share. In August, the monthly disbursement to stockholders was increased to $2; in September, to $2·50; in October, to $3; in November, to $4; and this month, to $5 per share. In July, the stock sold at from $30 to $35 per share, while last month the range was from $70 to $80 per share. After disbursing the dividend for this month the company will carry over the handsome surplus of over half a million of dollars. The Eureka (California) Gold Mining Company yesterday declared a dividend of $10 per share. The Natoma Water and Mining Company have declared a dividend of 1 per cent. for the past month. The Black Diamond Coal Company have declared a dividend of ½ per cent for November. During November, the deposits at the Mint in San Francisco amounted to 112,401 ounces gold, and 48,177 ounces silver for the same month last year. With the exception of October, the silver deposits were the largest this year. All crude bullion received at the Mint is now sent to the refinery, and hence it happens that some deposits are duplicated to the extent, perhaps, of one-fifth of the aggregate.—*Engineering and Mining Journal*, New York, Dec. 27.

VALUATION OF MINERAL VEINS.

A TABLE,—*For Calculating the Weight and Yield, per running Fathom, of Mineral Veins.*

BY E. J. CHAPMAN, PH.D.,

Professor of Mineralogy and Geology in University College, Toronto, and Consulting Mining Engineer.

The weight in tons and average richness of mineral veins are usually given per running fathom—that is, per parallelogram measuring 6 ft. in length and 6 ft. in depth, by the mean width of the vein, whatever the latter may be. The following table will enable these results to be calculated very rapidly, provided the specific gravity of the vein matter (mixed ore and gangue), and the average percentage of metal or mineral carried by the vein, be previously ascertained. The table has been calculated on the supposition that the sp. gr. equals unity, and that the average yield in metal is equivalent to 1 per cent. The values given in columns III. and IV. must thus be multiplied by the sp. gr. of the vein matter; and those given in column V. must be multiplied also by this quantity, and the resulting product must finally be multiplied by the average percentage of metal or mineral as ascertained by estimate or by actual assay. The values in column V. correspond to both the British ton of 2240 lbs., and the American ton (chiefly used in Canada) of 2000 lbs. Where the width of the vein is in feet and inches, the values of the two, as given in the table, must, of course, be added together.

EXAMPLE.—A vein averages 3 feet in width, with sp. gr. equal to 3·8, and percentage of metal equal to 2·6. Required the weight in British and American tons, and the yield (exclusive of loss in mechanical and furnace treatment) per running fathom.

3 tons (see the Table) × 3·8 = 11½ British tons (nearly).
3·36 tons (see the Table) × 3·8 = 12¾ American tons.
67·30 lbs. (see the Table) × 3·8 × 2·6 = 665 lbs.

Each fathom, therefore, of a vein of this strength, will contain 108 cubic feet; will weigh 11½ British and 12¾ American tons; and will carry 665 lbs. of metal.

I. Width of vein.	II. Cubic feet per fm.	III. English tons (2240 lbs.) p. fm.	IV. American tons (2000 lbs.) p. fm.	V. Metal in lbs. av. p. fm.
1 in.	3	0·0833	0·0933	1·87
2 in.	6	0·1666	0·1866	3·74
3 in.	9	0·2500	0·2800	5·61
4 in.	12	0·3333	0·3733	7·48
5 in.	15	0·4166	0·4666	9·35
6 in.	18	0·5000	0·5600	11·22
7 in.	21	0·5833	0·6533	13·09
8 in.	24	0·6666	0·7466	14·95
9 in.	27	0·7500	0·8400	16·83
10 in.	30	0·8333	0·9333	18·70
11 in.	33	0·9166	1·0266	20·57
1 ft. 0 in.	36	1 ton	1·12	22·43
2 ft. 0 in.	72	2 ,,	2·24	44·87
3 ft. 0 in.	108	3 ,,	3·36	67·30
4 ft. 0 in.	144	4 ,,	4·48	89·74
5 ft. 0 in.	180	5 ,,	5·60	112·17
6 ft. 0 in.	216	6 ,,	6·73	134·61
7 ft. 0 in.	252	7 ,,	7·84	157·04
8 ft. 0 in.	288	8 ,,	8·96	179·48
9 ft. 0 in.	324	9 ,,	10·08	201·92
10 ft. 0 in.	360	10 ,,	11·20	224·35

FOREIGN MINING AND METALLURGY.

The Saxon Machine Manufacturing Company has presented its report for 1869-70. The report states that the favourable anticipations entertained on the formation of the company have been realised. From April 1, 1869, to June 30, 1870, the net profit obtained amounted to 2,728,132 thalers, or 34 per cent. above the highest return secured by the old proprietors of the works transferred to the company upon its establishment. The war has not exerted at present any unfavourable influence on the current year's working. Some outlets have been closed to some extent, but, on the other hand, some very important contracts have been concluded with foreign railway companies. The mobilisation of the Saxon army has, however, deprived the establishment of a great number of workpeople. The dividend for the first exercise, embracing a period of 15 months, amounts to 6 per cent.

Stock-taking is now the principal occupation of the leading Belgian metallurgical establishments, and the tone of business at the various industrial centres has consequently been extremely quiet. Some proposals have, however, been made for contracts for rails, and a tolerable number of orders for plates, merchants' iron, &c., have also been received. Former rates are about maintained. In the Liége district the stock of pig and some descriptions of iron increases to such an extent as to induce ardent wishes for the conclusion of peace, which would not fail to give a great stimulus to affairs. The administration of the Belgian State Railways has now let contracts as follows for locomotives:—The Cockerill Company, at Seraing, five powerful engines for use on the Liége inclined planes, 2800*l.* each, or 14,000*l.* in all. The Belgian Railway Plant Company, at Brussels, seven passenger engines, at 2000*l.* each, 14,000*l.* The Cockerill Company, at Seraing, three passenger engines, at 2000*l.* each, 6000*l.* The St. Leonard Company, at Liége, seven goods engines, at 2000*l.* each, 14,000*l.* The Couillet Company, eight station engines, at 1500*l.* each, 12,000*l.* The total amount of the locomotive orders given out is thus 60,000*l.* The same administration has also let contracts for rolling stock as follows:—The Belgian Railway Plant Company, 36 passenger carriages (third class), 5544*l.*; the Morlanwelz Company, 56 closed trucks of 10 tons each, with breaks, 4032*l.*; the Haine St. Pierre Company, 58 open trucks for rails, 2784*l.*; MM. Noulet and Co., of Bracquegnies, 30 open trucks for rails, 1440*l.*; MM. Durieux and Co., of Louvain, 51 coal wagons to carry 10 tons each, with breaks, 3060*l.*; MM. Nicaise and Delcuve, of La Louvière, 51 similar coal trucks, 3060*l.*; M. Thevenet, of Antwerp, 58 coal trucks, without breaks, 2784*l.*; MM. Cabany and Co., of Gand, 58 coal trucks, without breaks, 2784*l.*; MM. Chas. L. Carels and Co., of Gand, 58 coal trucks, without breaks, 2784*l.*; MM. Brison and Co., of Mont-sur-Marchienne, 30 coal wagons, without breaks, 1440*l.*; and MM. Malengraux and Co., of Châtelineau, 30 coal wagons, without breaks, 1440*l.* The total amount of the contracts for the 516 vehicles ordered is thus 31,152*l.* The wheels, axles, springs, grease boxes, and some other accessories will be supplied by the Government, which has ordered them from makers specially devoting themselves to such specialities. The contracts have, however, it must be confessed been accepted at extremely low rates, and with the sole object of maintaining a little activity in the various workshops during the present crisis in affairs. No profit is expected to be secured in some cases.

The year seems to have opened tolerably favourable with the copper and tin markets of the Continent. The great thing which is, of course, needed is a cessation of the unhappy hostilities which are at present reducing a large part of France to misery and ruin. At Havre, Chilian in bars has made 64*l.* to 64*l.* 10s.; refined ditto in ingots, 73*l.* to 74*l.*; Peruvian mineral (pure standard), 70*l.* to 70*l.* 10s.; United States (Baltimore), 70*l.* to 78*l.*; ditto (Lake Superior), 80*l.* to 86*l.*; Mexican and Plata in bars, 66*l.* to 68*l.*; old yellow copper, 40*l.* to 44*l.*; red ditto, 62*l.* to 66*l.* per ton. At Marseilles, Toka for consumption has brought 80*l.*; refined Chilian and Peruvian, 80*l.*; rolled red copper in sheets, 80*l.* to 84*l.* per ton. At Rotterdam, Drontheim has made 50 fls. to 52 fls.; and Russian, 51 fls. Tin has been very firm at Rotterdam. Transactions have taken place at advancing rates, 78¼ fls. having been paid for disposeable Banca. Billiton has brought 77¼ fls. to 77¾ fls., and Banca for delivery in March and April, 77 fls. At Marseilles lead in saumons, first fusion, has made 18*l.* 16s.; ditto, second fusion, 17*l.* 8s.; ditto argentiferous, 17*l.* 18s.; lead in shot, 20*l.* 16s.; and rolled and in pipes, 20*l.* 16s. per ton. At Rotterdam, Stolberg lead has been quoted at 11 fls., and miscellaneous marks at 10¾ fls. At Marseilles zinc in plates has made 18*l.* 8s.; ditto rolled, 30*l.* per ton, with a discount of 3 per cent.

The North German Chancellery has invited tenders for 86 goods locomotives, 2000 open goods vans, and 4000 axles with wheels, all for railways in the province of Alsace. Tenders are to be sent to the North German Chancellery office, at Berlin, not later than Feb. 11.

The Haenichen Colliery Company recently held a general meeting at Dresden. The accounts presented were unanimously approved, and a dividend was declared at the rate at 4½ per cent. per annum. Both the production and the demand were larger in 1869-70 than in 1868-9, and a better dividend is anticipated for next year.

The Prague Metallurgical Company have just held a general meeting. The production of the company's goods showed an increase in 1869-70 of 19,500 tons, and their sale also showed an advance of 20,800 tons, as compared with the preceding exercise. The value of the production of the company's collieries declined last year to the extent of 4012*l.*, but, in consequence of the purchase of several workings in the Pelsin basin, a considerable increase in the production is anticipated. Better results were obtained from the Kladno Foundry last year; the production of the Kladno rolling-mills also increased last year to the extent of 18,700 tons. The net profits realised by the company in 1869-70 amounted to 126,491*l.*, or 40,573*l.* more than in 1868-9. The increase in the net profits last year arose almost entirely under the head of the rolling-mills. The dividend paid for 1869-70 will be at the rate of 16 per cent. per annum upon the share capital, after 11,953*l.* has been carried to the reserve fund, and after 14,309*l.* had also been set apart as a sinking fund in respect to the Nuerschau and Nucie establishments.

FOREIGN MINES.

DON PEDRO NORTH DEL REY (Gold).—*Telegram:* Produce for November, 8301 oitavas; weighed to December 17, 1018 oitavas.

TAQUARIL (Gold).—The directors have received the following telegram from Lisbon:—"Taquaril, Dec. 16: Stuff treated so far at stamp not rich; produce for month will, perhaps, not realise expectations."

CHONTALES (Gold and Silver).—The directors have advices from Mr. Belt, dated Dec. 7. Remittance of gold, 218 ozs., from 856 tons of ore; average produce 5 dwts. per ton. Cost for the month of November, $3951. The following extract from Mr. Belt's letters show that he is extending his operations into more productive ground, and that larger development will no doubt lead to profitable results:—

"San Antonio Mine.—Above No. 6 level the lower part of the stope has yielded 5 dwts. per ton, but the higher portion has only given 3 dwts. per ton. The connection level and the stopes above it have been very poor during the month, and we have discontinued the stopes in consequence, and are pushing on the level to get to the better ground, which we know is ahead.—San Benito Mine: I have surveyed and levelled the hill through which this lode passes, and I now enclose a section of it drawn to the same scale as the San Antonio section, by which you will see that we have a mine more than equal to it in size, pratically untouched. Between the points marked A and B in section the lode on the surface will yield 10 dwts. per ton. Further west no trials have been made until we come to the Ampara Mine, which is on the same lode. They have worked it right up to our boundary, and a fine large lode is seen entering our sett. The proprietor informs me that for 4 ft. wide it yielded ½ oz. per ton up to the boundary. We have commenced a level which I purpose to drive up under the good ground seen between A and B. Santo Domingo lode has been cut in the deep level, and, thought it only washes 3 dwts. per ton where we have opened on it, it is of a very promising character. The health of the establishment continues good.

San Antonio Mine.—Report for November: The No. 1 stope, in back of the No. 6 level, has been stoped 71 varas; lode 3 ft. wide, worth 5 dwts. of gold per ton. No. 2 stope, in back of the same level, has been stoped 69 varas; lode 2 ft. wide, worth 3 dwts. of gold per ton. The lode in this stope has greatly fallen off in size and value. A stope in back of the connection level has been stoped 19 varas; the lode at present is small and poor. A stope in back of the No. 5 level, west of Piper's shaft, has been stoped 18½ varas; lode 3 ft. wide, worth 10 dwts. of gold per ton. The connection level has been driven east on the course of the lode 21 varas; lode at present 2 ft. wide, worth 3 dwts. of gold per ton. Driving east of the new cross-cut, on the course of the lode, 16 varas; lode 3 ft. wide, showing a little gold, but not to value. Driving west of the new cross-cut, on the course of the lode, 14¾ varas; lode 3 ft. wide, worth 3 dwts. of gold per ton. Santo Domingo deep adit level has been driven 8½ varas, which has cut through the Santo Domingo lode, which is 3 ft. wide, worth 3 dwts. of gold per ton; the lode is easy for driving, and has a very kindly appearance. In consequence of the falling off in value of the connection level and the No. 2 stope the returns have been considerably reduced. The number of tons sent to the stamps for the month is 856, which I estimate at 5 dwts. of gold per ton.—JOHN TONKIN.

ECLIPSE (Gold).—Captain Barratt reports:—You are aware by former communication that we discovered a little auriferous galena and silver ore in a cross-course or cross-lode. In sinking our main shaft below the 160 ft. level we found it entered the cross-course or cross-lode, and that the latter became metalliferous and highly mineralised, producing excellent silver ore. Being a distinct lode, any person could locate it, and I immediately applied to the Government authorities, located it, and have now 3000 lineal feet (500 fms. in length) on the so-called cross-course or cross-lode, now called "Barratt's Lode," the deed for which I enclose, signed, sealed, and delivered to me by the United States Government authorities, and the 3000 feet of Barratt's lode is transferred to the directors of the Eclipse Gold Mining Company (Limited), for the Eclipse Gold Mining Company (Limited), and it is now their property for ever. I find by careful observation that the Eclipse lode bears about 40° west of north, and Barratt's lode about 40° east of north. Finding I could not take up or locate any property in the names of the directors or company who were absent from the country, I employed my own name, my son's, Captain Francis's, and the names of others employed by the company, and then for the consideration of $20 (4*l.*), we have sold and transferred to the company the property mentioned. The company can purchase, but cannot locate. However, the business is done all right. The expenses in locating and transferring, including the deed, did not cost $60 (12*l.*), and I consider that property (the new grant of 3000 feet), from present appearances is worth more than 60,000*l.* for sale, and probably ten times that amount for working. You will see by to-day's report that I have had twelve samples assayed, yielding an average of $789·93 or 157*l.* 19s. 8d. per ton of 2000 lbs. There is also a little gold in the ore, but I think not sufficient to be of much value. We are now taking out auriferous mineral (ore) from the Eclipse lode, and silver ore from Barratt's lode. The foregoing samples yielded well, and from all appearances there is a great quantity of the ore, and I believe we shall have a great mine also on Barratt's lode. The company have now 8100 feet on the Eclipse lode, and 3000 feet on Barratt's lode, making 11,100 feet, and, I believe, the largest mining grant in California. There is sufficient in both grants to lease or sell two extensive mines, as the present Eclipse Company cannot work out or exhaust their now extensive mining property for generations to come. I anticipate our lodes will greatly increase in value as we develope in depth. We have a crevice in the bottom of the shaft, and the temperature in the mine since we discovered the silver ore has increased, I should think, 30°.

ALMADA AND TIRITO.—J. P. Clemes, Nov. 14: The lode has been cut north of the slide in the Tirito tunnel. Much water is issuing from the end, and the Providencia works are draining rapidly. The Tirito stopes are looking better than usual. The work of cutting space for the machinery is well advanced. Altogether the prospects are encouraging. They have about $13,000 on hand. There are heavy payments to make before the new machinery is laid down, or they would make a remittance by the next "conducta." The Customs' authorities at Guaymas have, so far, refused to allow the vessel with the machinery to proceed to Agiabampo, after reporting at Guaymas, the rule being to tranship to a coaster carrying the Mexican flag. There is still, however, a slight chance of obtaining the required consent. The question of finally selecting between Agiabampo and Ybarros, as to the local port of this district, is at present before the Central Government. Agiabampo has a chance of getting the preference. The health of the place has improved, none of the employees being at present on the sick list. The July accounts, lost in the Continental, show—Profit, $4428; ore crushed, 261 tons; ley, $49. In a later letter, dated Nov. 21, Mr. Clemes writes:—During the past week we had to stop the stamps four days; it is now again doing fair duty. Clean first-class ore has accumulated to about 120 tons, and inferior ores to about 100 tons. In the mine the stopes continue to look well, and are yielding a fair supply for the mill, of good quality ores. The yield of Pitanque continues at an increased rate; close to the north slide is the most productive place for this class of ore. We are in daily expectation of advices for shipment. The rainy season is over, labour is plentiful, and the health of the place good. The profit for November was $4466.

EXCHEQUER (Gold and Silver).—Dec. 19: During the past week the main tunnel has been driven 5 ft. The stope from the 80 has yielded 7000 lbs. of third-class ore. The shift in the 50 have been timbering, which is completed all but one set. I think we are to have a cross ledge here, from the appearance of the drift—probably the Acacia. The windlass shift raised 300 buckets of water.

CAPE (Copper).—The Spectakel report for October shows no important change in the operations. The Ookiep report for November may be expected as usual by the following mail. A favourable report is received of Koperberg tramway laying going on well. Six miles completed from Oct. 18 to Nov. 22; present rate of plate-laying being six miles per month. Steel wheels continue to wear well.—Smelting: Blast-furnace had been lighted, and gave good results. The operations have been suspended until the engine-room from the old smelting-house could be erected at the new works. Mr. Thielen is succeeding in making bricks at a very moderate cost, and they are found to stand well the heat of the furnace. The Croydon had left Portnolloth, and arrived at Hondeklip to complete homeward cargo. The Antonio Vinent was discharging and commencing to load at Portnolloth. Since the last notice 600 tons have been sold at Swansea by public ticket, realising 12s. 9d. per unit.

[For remainder of Foreign Mines see to-day's Journal.]

CHALLENGE TO THE WORLD.—The *Bristol Daily Times and Mirror*, Aug. 15th, has the following: Messrs. J. C. Swan and Co., of 16, Queen-square, in this city, have invented a pocket microscope, which is a marvel in all that such an instrument should be. It has great power, remarkable definition, and does not require focussing. The cheapness of the article will make it exceedingly popular when its merits are more widely known. It is called the "Bristol Microscope," and is a great credit to the inventor, as much for its extreme simplicity as its power.—The *Western Daily Press* says: The Bristol Microscope has a magnifying power of 20,000 times, &c.—The *Western Daily Telegraph* says: The Bristol Microscope is the most compact and useful scientific instrument we have ever seen; it possesses extraordinary power, and is very easily managed, &c. The price of the Bristol Microscope is only 2s., or free by post, with printed directions, for 28 stamps.—Address, J. C. Swan and Co., Opticians, 16, Queen-quare, Bristol

LONDON GENERAL OMNIBUS COMPANY.—The traffic receipts for the week ending Jan. 15 were 8178*l.* 15s. 9d.

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